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(71) Applicant(s) Andrew Cunningham Thomson 15 Saunders Copse, Mayford, WOKING, Surrey, GU22 0NS, United Kingdom Penelope Anne Thomson 15 Saunders Copse, Mayford, WOKING, Surrey, GU22 0NS, United Kingdom	(56) Documents Cited GB 1061961 A EP 0348310 A EP 0250657 A US 4456687 A US 4455359 A US 4378392 A (58) Field of Search UK CL (Edition O) G2X XB5G INT CL ⁶ G03C Online:WPI
(72) Inventor(s) Andrew Cunningham Thomson Penelope Anne Thomson	
(74) Agent and/or Address for Service Gee and Co Chancery House, Chancery Lane, LONDON, WC2A 1QU, United Kingdom	

(54) Abstract Title
Moudable photographic material

(57) A mouldable photographic material (1) is made up from a thermoplastic base sheet (2), a primer coating (3) which provides the key for a photographic emulsion layer (5) and, following exposure and development a thermoplastic foil (6) is laid over the emulsion layer (5) and bonded in place using an optical quality adhesive. Sheet (2) may have adhesive layer (8) on release film (10) applied to the back side (9) so that it can be adhered to part (7). Sheet (2) preferably contains fragments and is made of PVC or polycarbonate. Foil (6) is preferably made of PET.

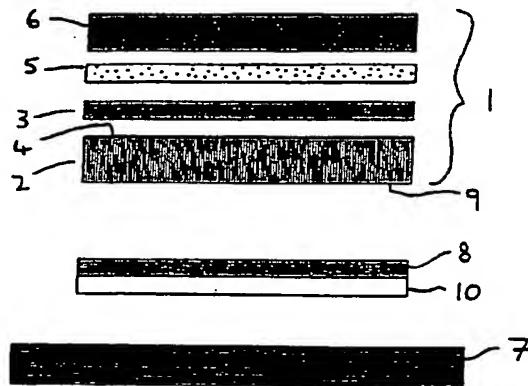


Figure 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995

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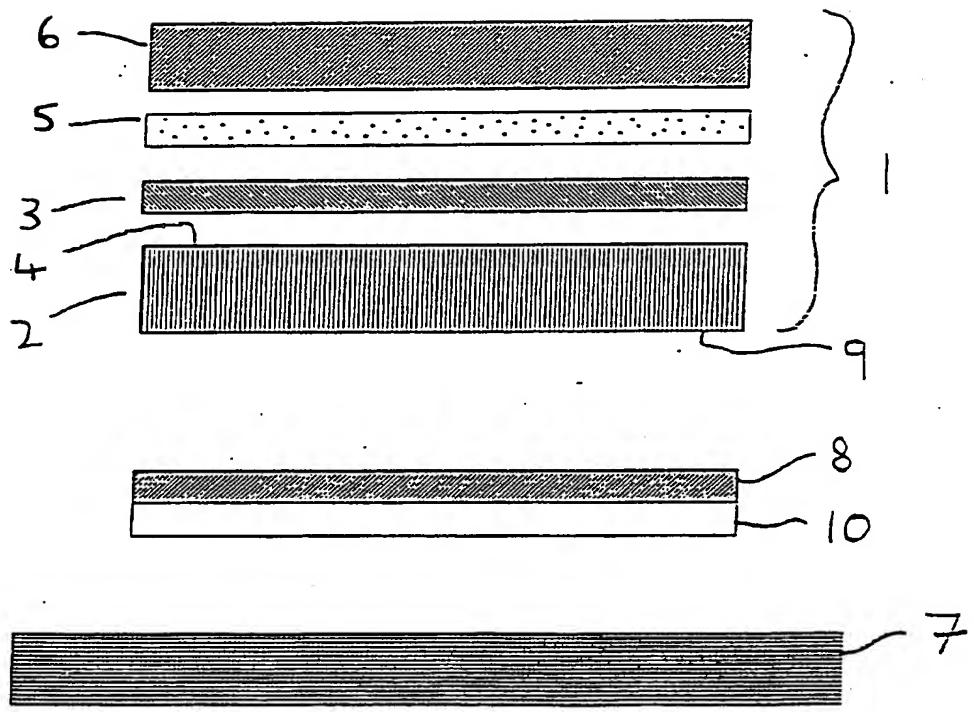


Figure 1

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Mouldable photographic material

The present invention relates to a mouldable photographic material and a method of forming same, particularly, although not exclusively for decorative use.

Conventional photographic material lacks stability when subjected to heat. Consequently, such material is unsuitable for use in moulding processes and other environments where it might be subject to thermal and other forms of environmental stress. The desirability of a photographic material which is capable of being formed into for example the trim components of a vehicle or the housing of a consumer electrical item is clear. Consequently, there have been many attempts to obtain a suitable mouldable photographic material. An early example of such an attempt is shown in French Patent No. 968,638 which relates to a method for the preparation of photographic surface for moulding and also U.K. Patent No. 739,477 relating to photographic silver halide films. However, none of the attempted solutions to date has achieved a satisfactory solution free from defects in appearance particularly cracking of the image and heat induced distortion.

It is therefore an object of the present invention to provide a photographic material and method for producing same which material is capable of being moulded under conditions of heat and/or pressure without suffering the degradation in quality and finish shown exhibited by the prior art. It is a further object of the present invention to provide such a material which may be produced without the need for specialised equipment.

According to the present invention, there is provided a mouldable photographic material comprising a thermoplastic base sheet, a primer layer providing a key for a light sensitive layer, and a protective thermoplastic foil, the foil being bonded to the light sensitive layer with an optical quality adhesive.

Whilst the material may be provided for subsequent processing in individual sheet form advantageously the material could be prepared in roll form thereby enabling the product to be used in a continuous production process.

The thermoplastic base is preferably formed from a PVC material although a polycarbonate can be equally effective particularly where the physical characteristics of polycarbonate provide advantages in terms of the final moulded product. In the either case, the material is preferably pigmented to form an opaque white which ensures accurate rendition of colour in the exposed light sensitive layer. The thermoplastic foil may be formed of any suitable material exhibiting the desired physical properties, e.g. scratch resistance. Accordingly, polyester and polycarbonate foils have been found to be particularly effective.

Where a PVC material is used as the base, an additional compound to prevent plasticiser migration may be included in the primer layer or, indeed applied as a separate layer. Similarly, a compound to prevent water migration may be included where the base is a polycarbonate material. Further adhesive layers and the like may be added to both sides of the material, i.e. the uncoated side of the base and the protective foil depending on the particular application of the material.

According to a further aspect of the invention, there is method of forming a mouldable photographic material in which a thermoplastic base is coated with, in order, a primer layer, a light sensitive layer, and following drying is bonded to a protective thermoplastic foil.

In order to aid in understanding the invention a specific embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic cross-sectional side view of a mouldable photographic material according to the invention shown together with a part.

Referring to the sole Figure, the material 1 includes a thermoplastic support or base sheet 2 of pure white colour and 200 micron thickness. After extensive tests the most suitable PVC material for the sheet has the following formulation:

PVC polymer	100	(polymer)
Di-iso-decyl Phthalate	14	(plasticiser)
Octyl Epoxy Stearate	3	(co-stabiliser)
Barium Zinc Stabiliser	3	(stabiliser)
Titanium Dioxide	16.5	(pigment)
Ultramarine Blue	0.1	(pigment)
Ultramarine Violet	0.04	(pigment)
Carbon black dispersion	0.14	(pigment)

in which the level of residual VCM monomer is less than 10ppm and perhaps as low as 2ppm.

Using conventional pass through machinery, a primer coating 3 is then applied to a display side 4 of the base 2, the coating 3 is formulated to provide a keying surface for a photographic emulsion layer 5. The coating 3 may

optionally include a compound to prevent plasticiser migration from the base 2.

Once the photographic emulsion layer 5, which may be of conventional type, e.g. Agfa Type 10, has been applied, the resulting sandwich comprising the base 2, coating 3 and layer 5 is, of course, sensitive to light. Accordingly, the unexposed sandwich must be carefully handled prior to an exposure step in which an image is formed, suitably a wood-grain, although any other required image may be formed. The exposed sandwich is then developed using conventional machinery and dried. A protective layer of thermoplastic material, in this case a polyester foil or sheet material 6 is then laid over the display side 4 of the sandwich to provide scratch-resistance for the photographic layer 5 and/or improve the resistance of the material 1 to UV-light induced degradation.

One particularly suitable protective material is the 200 micron thickness PET-foil produced by AUTOTEX under designation V200 UV. An adhesive suitable for securing such a material to the sandwich must be clean and colourless on drying in order not to be detrimental to the optical quality of the image. One such adhesive has been found to be that produced by National Starch and Chemical Limited under product code 380-1846, having the following specification.

Appearance:	clear water white solution
Solids:	29-31%
Viscosity (Brookfield):	250-350 cps
Flash Point:	-4°C
Diluent:	Ethyl acetate
Solvent Blend:	Hepatane 22, Toluene 57, Isopropanol 18, Ethyl Acetate 3

Depending on the final end use of the material 1, further optional layers may be applied. Thus where the material is destined to be bonded to a separate part 7, an adhesive layer 8 may be applied to the non-display side 9 of the base 2 and protected until application to the part 7 by a release film 10. However, where a PVC base 2 is used, an adhesive may not be necessary as conventional heat rolling should be sufficient to bond the material 1 to the part.

It will be noted that there is no requirement for balancing layers or coatings to be applied on the non-display side of the base. In particular, there is no requirement for a non-curl layer. It will also be recognised that important benefits are attached to this feature, namely the reduction in cost through reduced material requirements and perhaps more importantly, the reduction of the number of machinery passes required.

Whilst the above example refers to a PVC base which provides an extremely wear resistant product, the product and process can equally be formed on a polycarbonate base. A polycarbonate based material is particularly suitable for moulding complete items e.g. casings for televisions, monitors, (laptop) computers, and the like where the extremely good impact strength and rigidity exhibited by the material are desirable.

It has been found that the above product in both PVC and polycarbonate form is capable of being formed into complex shapes using conventional moulding processes without degradation and that furthermore over extended periods the material remains resistant to fading and is stable at the elevated temperatures found within the interior of a motor vehicle, for example.

Claims:

1. A mouldable photographic material comprising a thermoplastic base sheet, a primer layer providing a key for a light sensitive layer, and a protective thermoplastic foil, the foil being bonded to the light sensitive layer with an optical quality adhesive.
2. A material as claimed in Claim 1, wherein the base is pigmented to form an opaque white which ensures accurate rendition of colour in the exposed light sensitive layer.
3. A material as claimed in Claim 1 or Claim 2, wherein the base is formed from PVC.
4. A material as claimed in Claim 1 or Claim 2, wherein the base is formed from a polycarbonate.
5. A material as claimed in any preceding Claim, wherein the foil is formed from acrylonitrile butadiene styrene.
6. A material as claimed in any one of Claims 1 to 4, wherein the foil is formed from a polycarbonate.
7. A material as claimed in Claim 3 and any claim appendant thereto, wherein the primer layer includes a compound to prevent migration of the plasticiser.
8. A method of forming a mouldable photographic material in which a thermoplastic base is coated with, in order, a primer layer, a light sensitive layer, and following exposure, developing, and drying steps a protective thermoplastic foil is bonded to the light sensitive layer.
9. A method according to Claim 8, including the further step of moulding the material into an article.



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Application No: GB 9702669.4
Claims searched: 1-9

Examiner: Meredith Reynolds
Date of search: 2 January 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G2X(XB5G)

Int Cl (Ed.6): G03C 11/08,11/10

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 1061961 (Kodak)(page 2 lines 17-23,Exs)	1,3,8
X	EP 0250657A (Agfa)(page 5 lines 21-25,Exs)	1-3,8
X	EP 0348310A (Kodak)(page 5 lines 45-62, page 7 lines 48-50, Fig 1)	1,5,8
X	US 4456667 (Agfa)(Col 3 lines 33-50,Exs)	1-2,8
X	US 4455359 (")(Col 3 lines 43-47, Exs)	1-2,4,6,8
X	US 4378392 (Segel)(Figs, Col 3 lines 31-36, Col 4 lines 41-60)	1,5,8
X	US 4370397 (Ceintrey)(Fig 2,Col 6 lines 2-8, Col 9 lines 46-66,Exs)	1,3,8

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

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